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(54) Dismantleable prefabricated modular building

(57) Prefabricated modular buildings are made using a system comprising a plurality of interlocking panels (13, 14, 15) each composed of two cladding layers (22a, 23a) of rigid material spaced by by an internal framework of spacing frame members, in which at least one edge portion of each panel (13, 14, 15) is provided with a longitudinal channel (27a) defined by edge portions of the cladding layers (22a, 23a) projecting beyond an elongate spacing frame member extending generally parallel to the said edge portion, in which, to interconnect the panels, the tongues (24a) of at least some of the panels project orthogonally of the edge portions defining the longitudinal channels (27a).

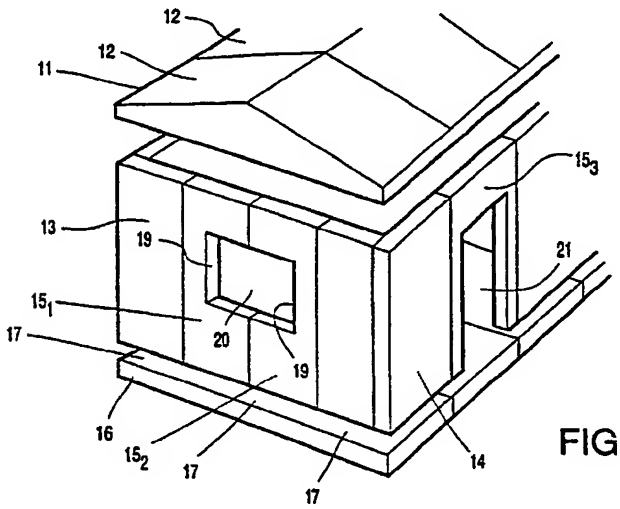

FIG 1

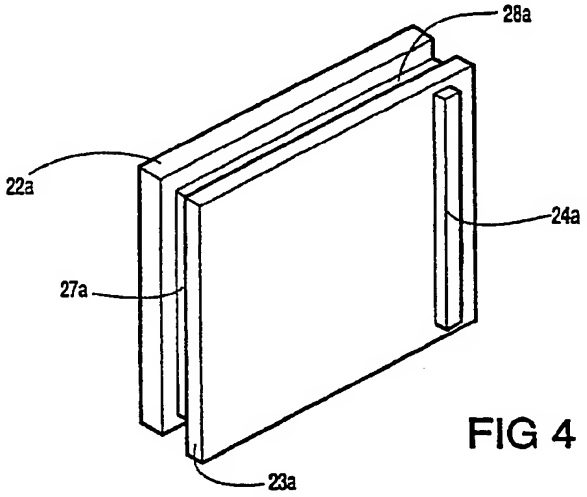

FIG 4

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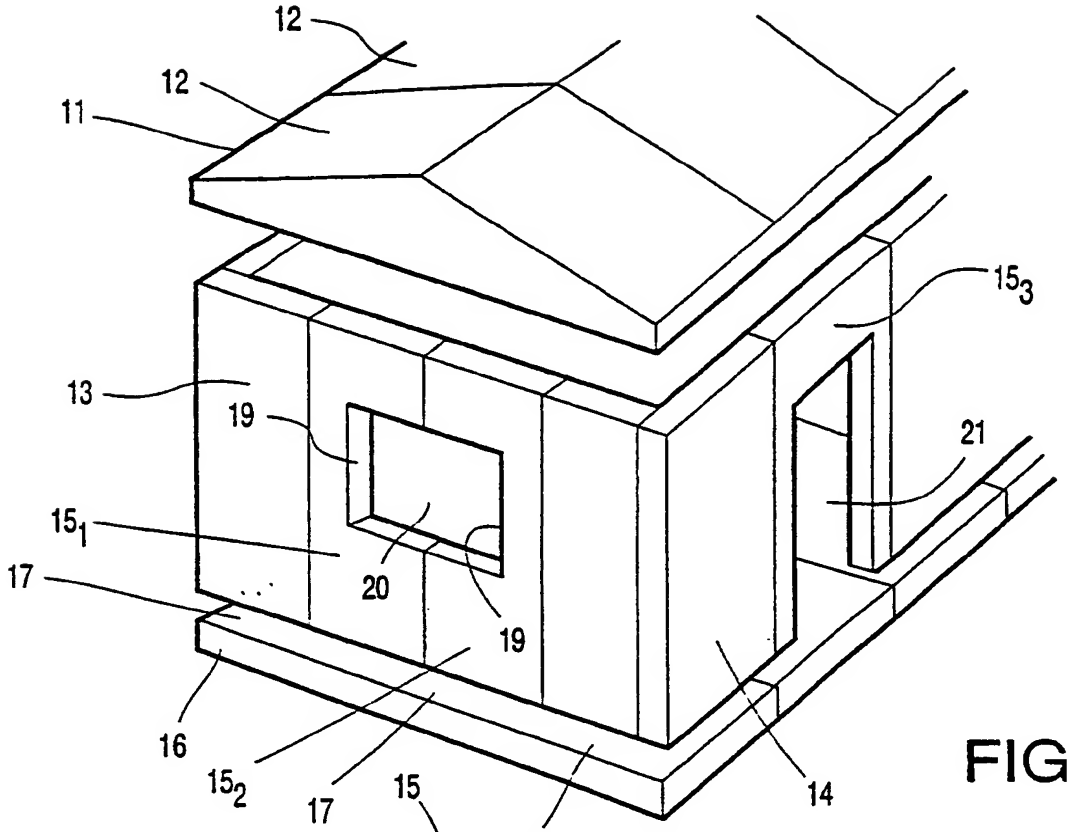


FIG 1

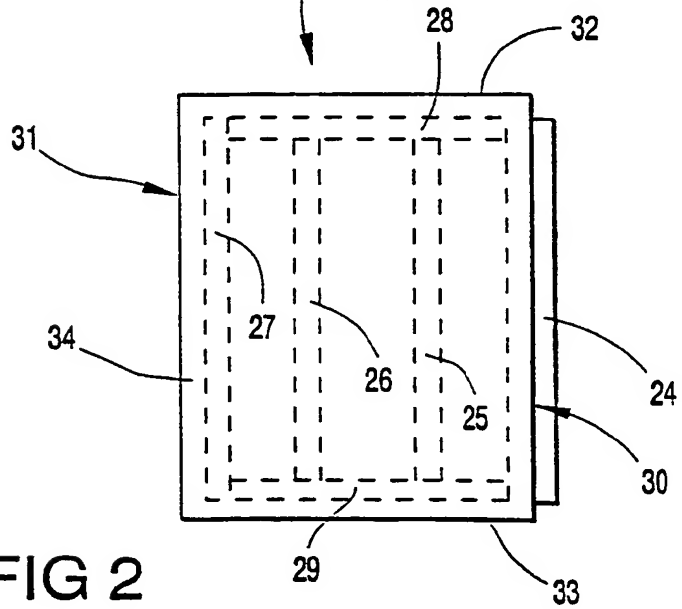


FIG 2

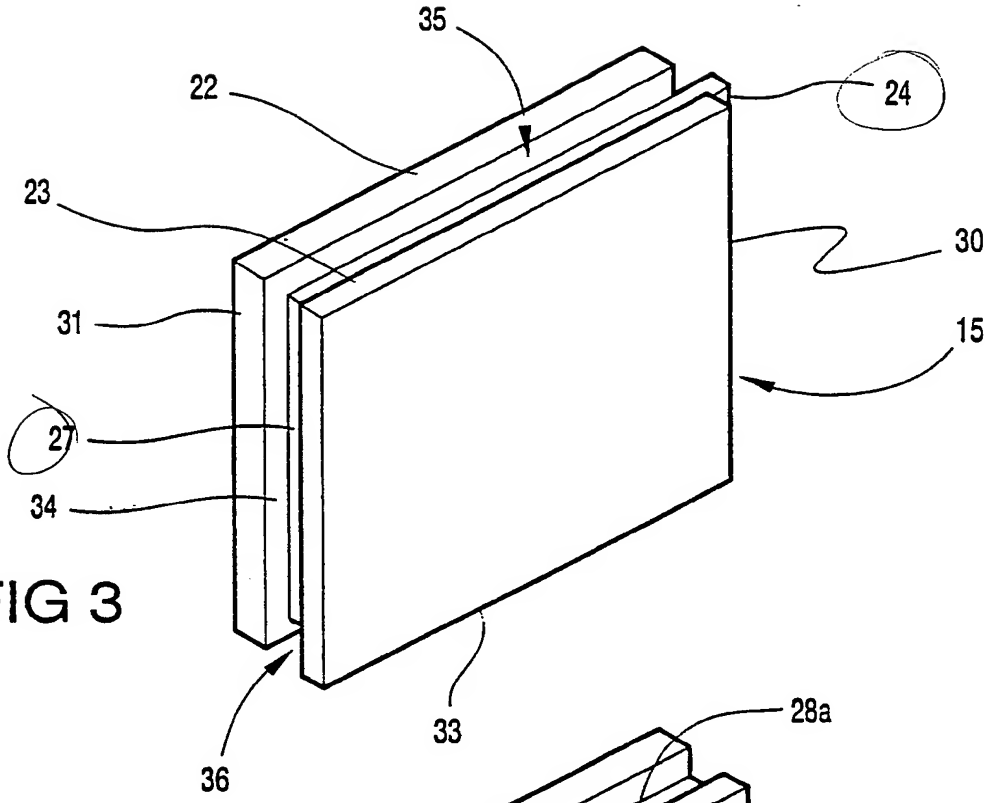


FIG 3

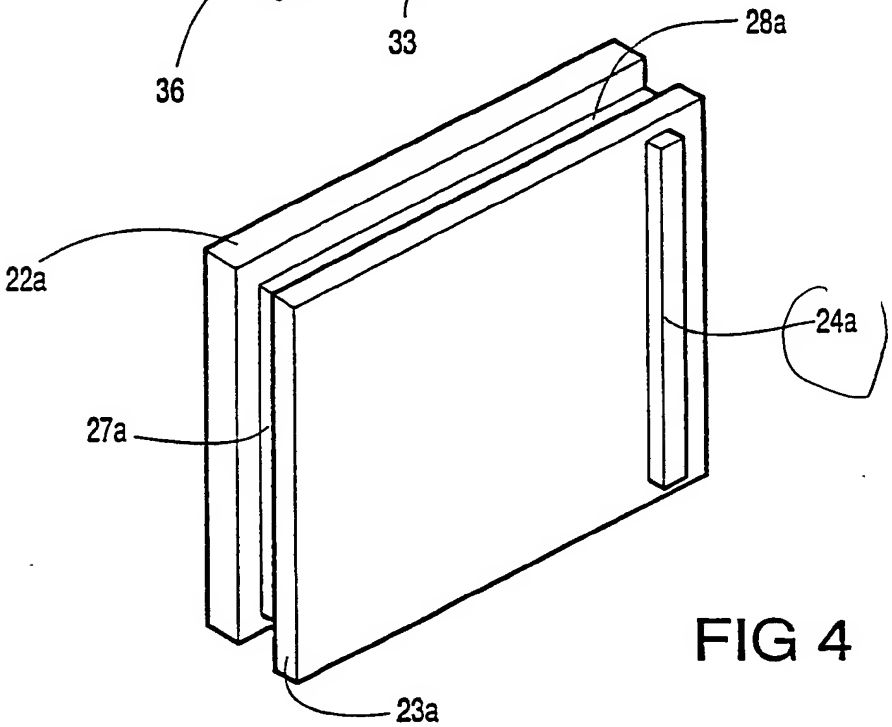


FIG 4

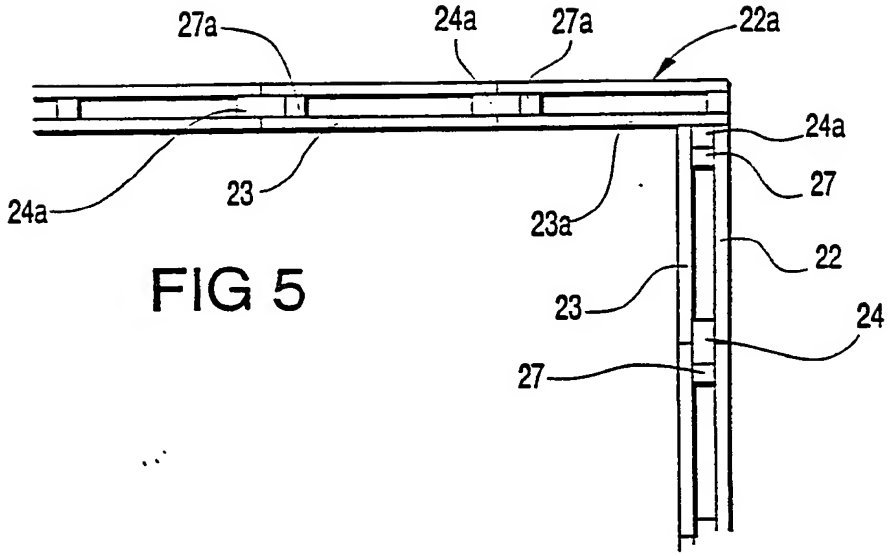


FIG 5

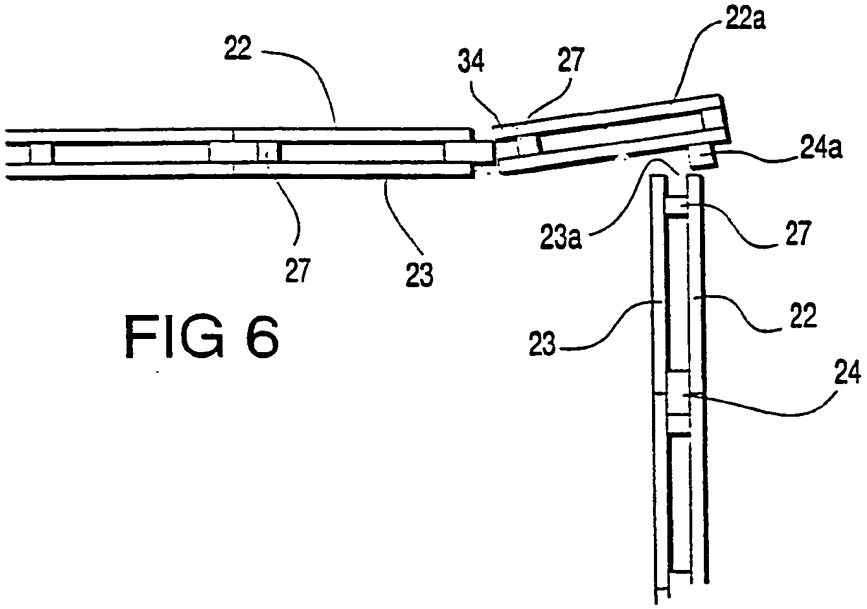


FIG 6

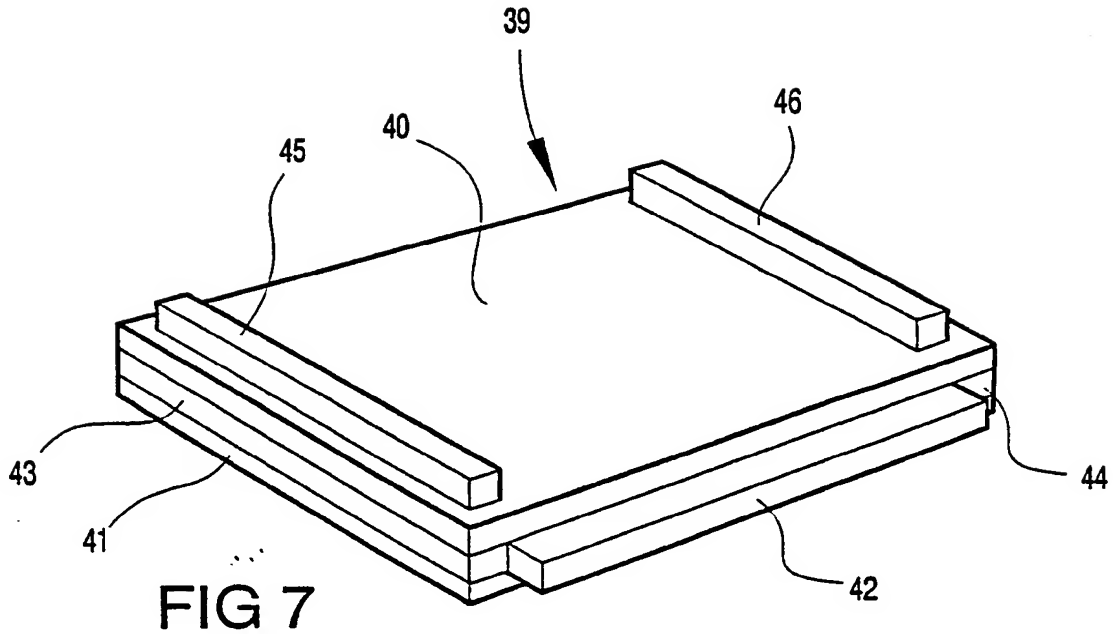


FIG 7

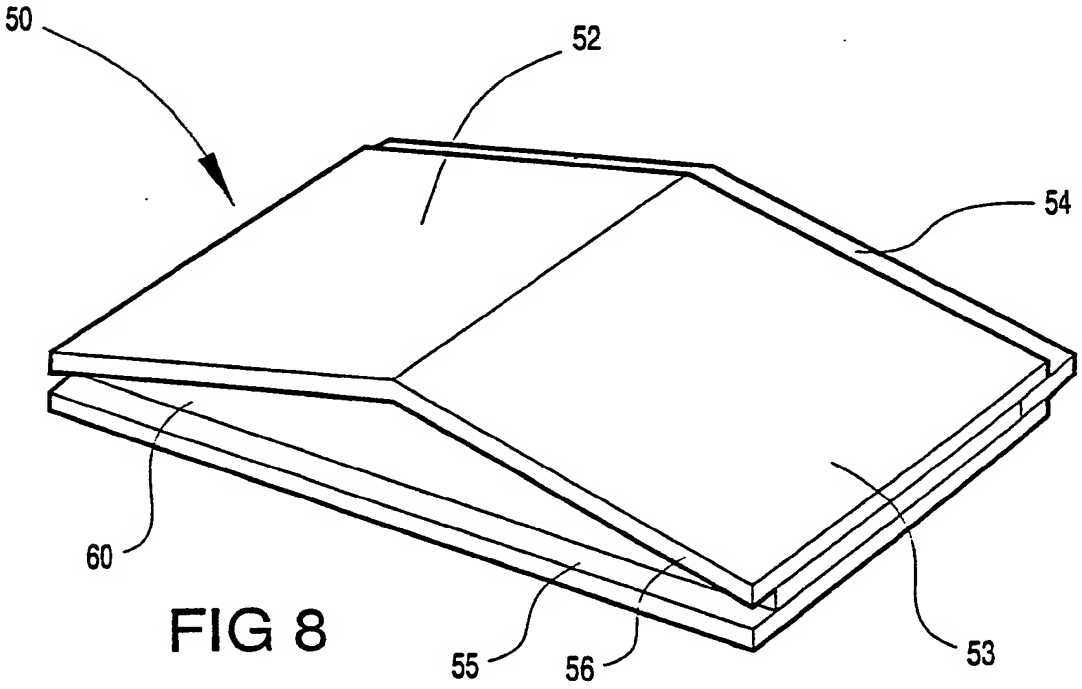


FIG 8

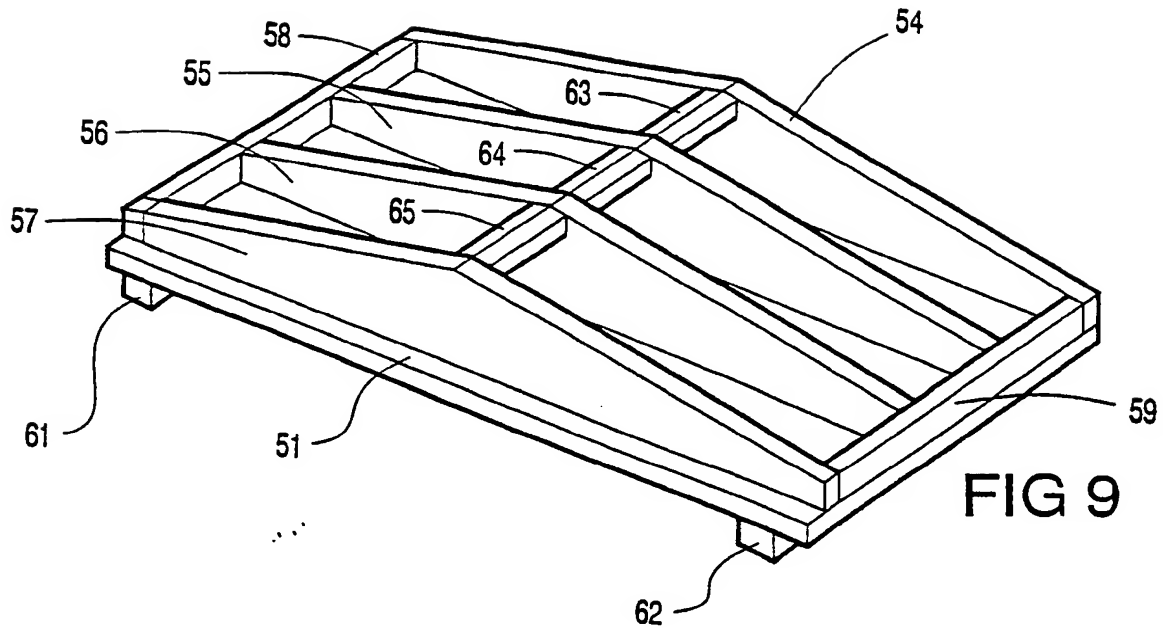
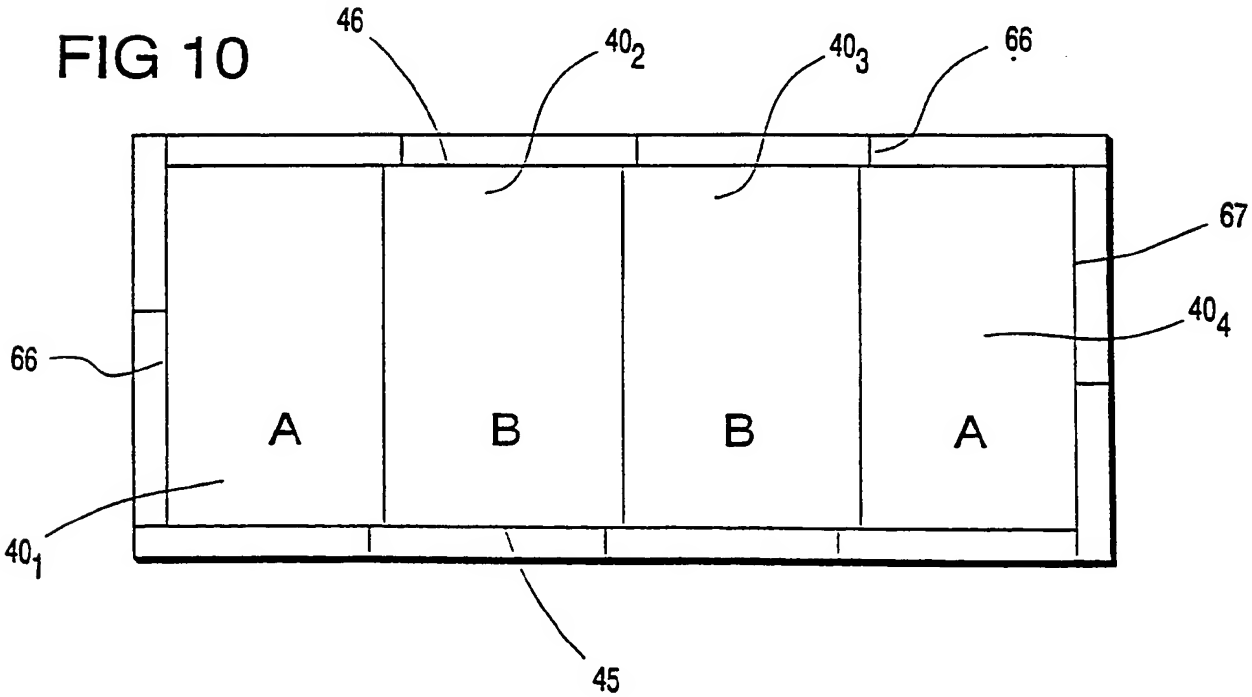


FIG 9

FIG 10



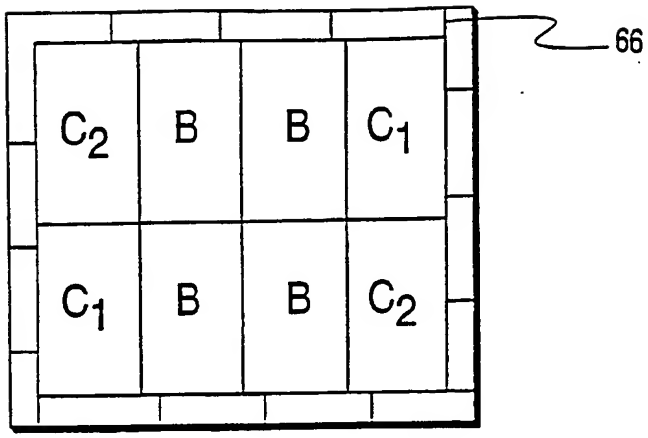


FIG 11

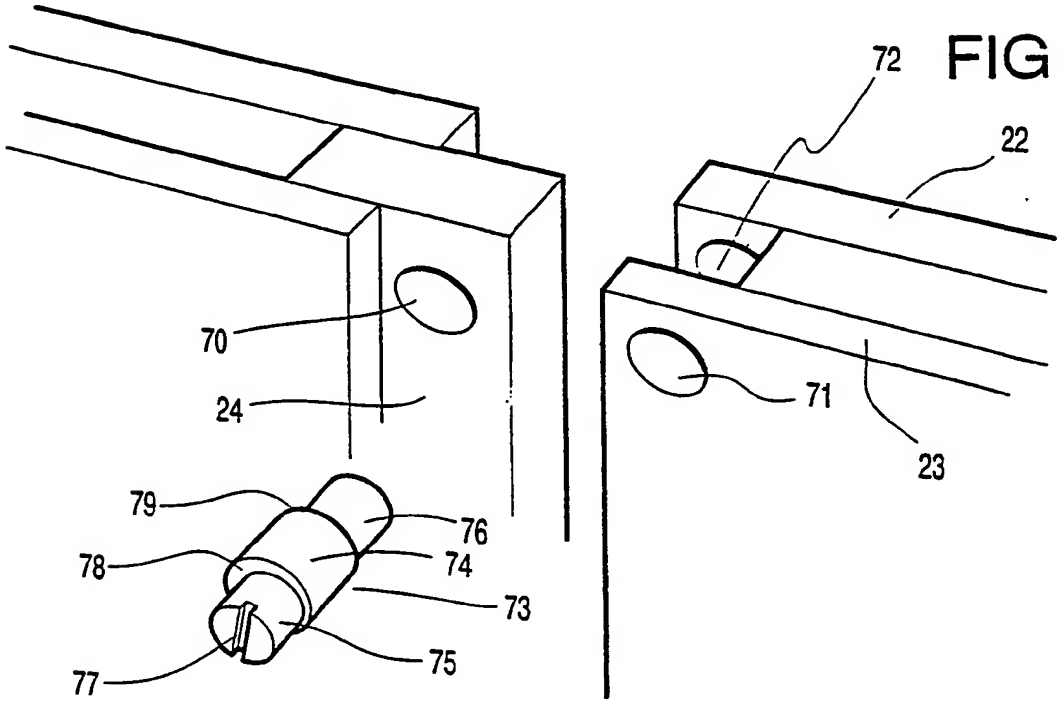
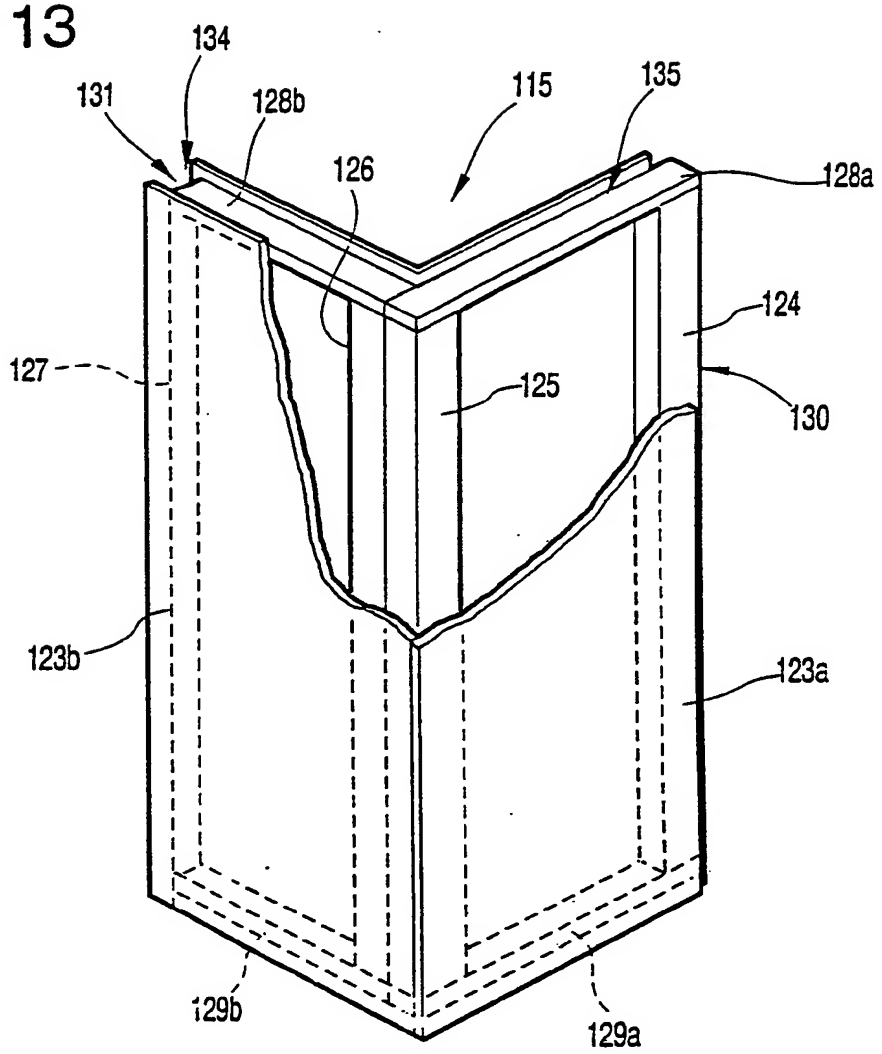


FIG 12

FIG 13



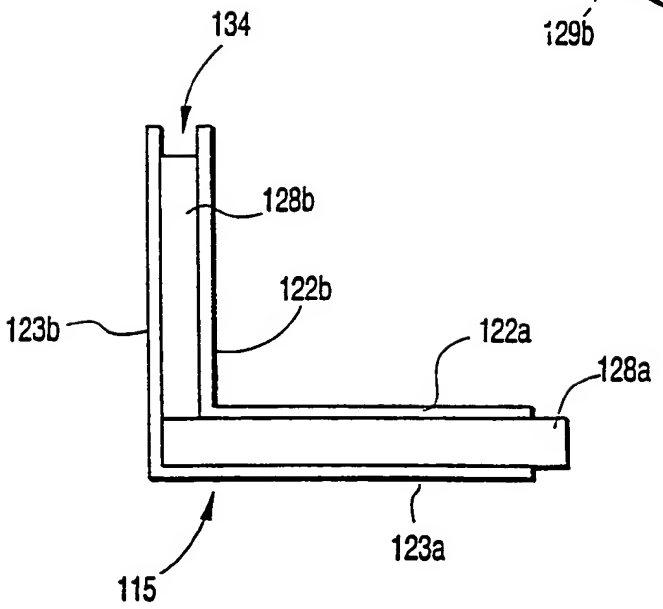
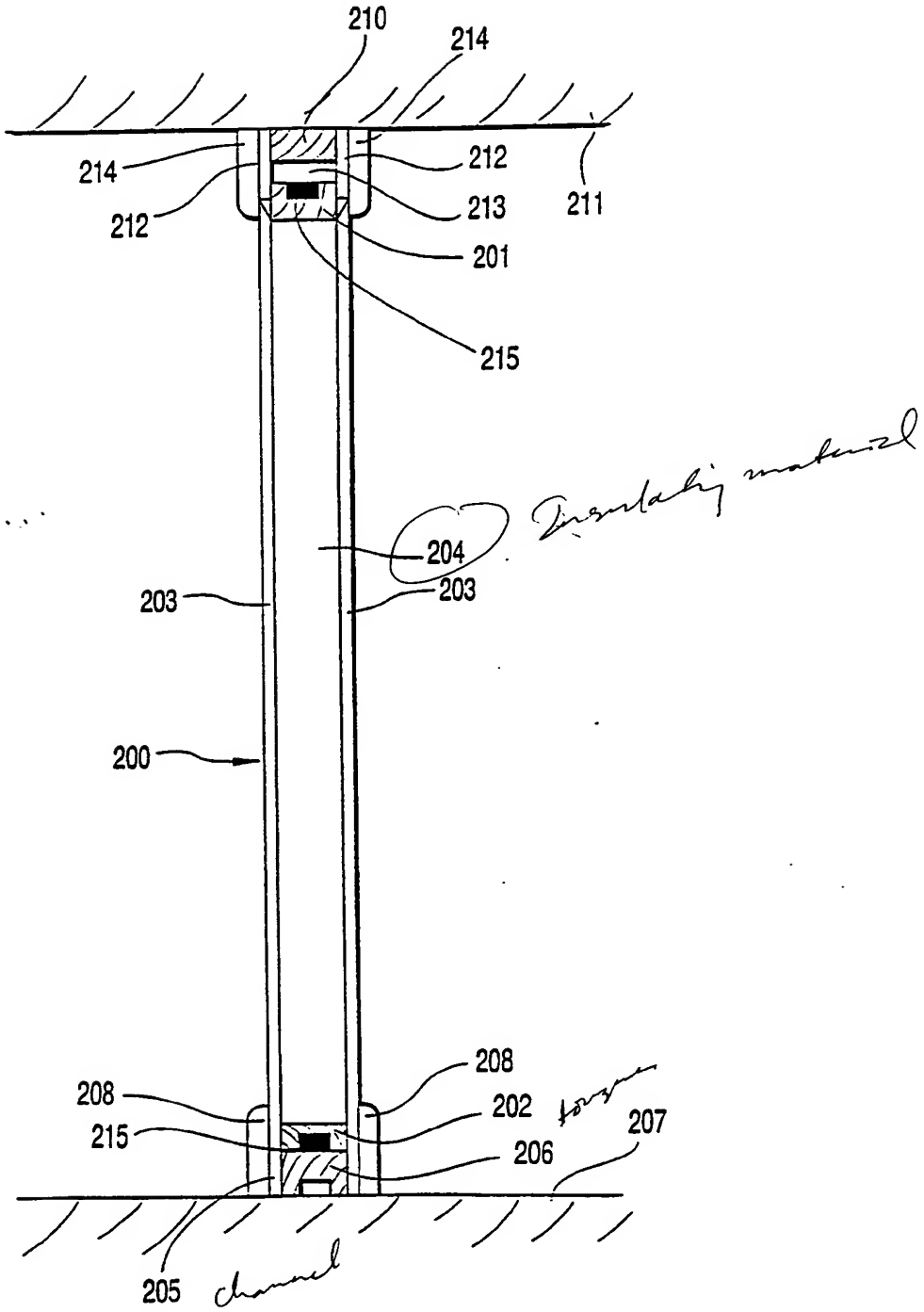


FIG 14

FIG 15



A SYSTEM FOR CONSTRUCTING A DISMANTLEABLE PREFABRICATED MODULAR BUILDING

The present invention relates generally to a system for constructing a dismantleable prefabricated modular building, to a building when constructed using the building system of the invention, and to a panel for a dismantleable prefabricated modular building.

Prefabricated modular buildings are erected for economy, convenience and speed. Although modular buildings in which individual building elements are prefabricated and fitted into place using cranes and other machinery are known, such buildings are not readily dismantleable and the prefabrication system utilises conventional materials such as cast concrete and traditional calcium aluminium silica cements for bonding junctions and effecting a seal between adjacent modular elements and between these elements and the floors.

The present invention finds particular utility in connection with the construction of so-called "portable" modular buildings, namely buildings erected for a limited period of time with the intention that they should be transferred to a new site at a later date. Typically, such modular buildings are used for temporary accommodation and may be reused many times at many

different sites during their lifetime. For this reason the buildings must be so constructed that the modular building elements can be reused without damage and may be readily handled to position them for erection of a building and dismantle them from the building. This places a limit on the overall size of the individual modular building elements or panels if it is intended that manual labour shall be used for erection and dismantling of the buildings. Larger panels may be used if machinery is to be used.

According to one aspect of the present invention there is provided a system for constructing a dismantleable prefabricated modular building comprising a plurality of interlocking panels each composed of two cladding layers of rigid material spaced by an internal framework of spacing frame members, in which at least one edge portion of each panel has a longitudinal channel defined by edge portions of the cladding layers projecting beyond an elongate spacing frame member extending generally parallel to the said edge portion, and an opposite edge portion of each panel has a tongue extending parallel to said edge portion but projecting therefrom for cooperating engagement in a said longitudinal channel of another of said panels to interconnect the panels, the said tongues of at least some of the panels projecting orthogonally of the edge portions defining the longitudinal channels to enable the respective panels to

be used as corner members of the building.

When erecting a building of, say, four walls utilising a plurality of prefabricated modular building panels each having opposite channels and tongues it is relatively straight forward, when building a straight wall, to fit adjacent panels together. At corners, however, special structures are required in order to form the requisite interlock with adequate strength and to seal the building at the corner. Previously this has been done by leaving the internal cladding panel short, stopping it at the spacing frame member defining the bottom of the channel, and positioning the spacing frame member of the cooperating panel at the edge of the panels so as to form a closed end. This results in difficulties, however, when fitting the last panel of a building, since, in order to introduce the tongue into the channel of one edge it is necessary to position the panel at an angle due to the fact that the interengagement at the corner cannot take place until the tongue has been fully inserted into the channel.

When working to close tolerances the necessary clearance is not available to allow such inclination without causing damage to the panel in an attempt to fit it. By providing the tongue on the face of the panel it is possible to form the interconnection of the last panel in a building without requiring the same degree of

inclination of the last panel although a small inclination, within the working tolerances of the panel, is still required.

The system of the present invention may further include a composite roof composed of a plurality of panels each having two cladding layers and opposite edges formed with cooperating tongues and channels for interengagement between adjacent roof panels.

The upper edges of a wall composed of a plurality of panels may be reinforced by an elongate interconnecting member spanning at least the junctions between adjacent panels. Such interconnection members may be housed in upwardly open channels in the wall panels, and may, in some embodiments, be formed as a tongue projecting downwardly from a roof panel whereby to interconnect the roof panel and the wall panel or panels.

The system of the present invention may further include a composite floor composed of a plurality of panels each formed from two cladding layers spaced by an internal framework of spacer frame members and opposite edges of which are formed with respective channels and tongues for interengagement between adjacent such floor panels.

The interengagement between the composite floor and the walls panels may be achieved, in a first embodiment, by an elongate tongue of the floor panels engaged by a

channel in the bottom edge of each wall panel. Such elongate tongue projects from the floor panel in a manner similar to that of the tongue on the wall corner panel, but is adjacent an edge extending orthogonally of that from which the wall panel tongue extends.

The roof may be secured to the upper edges of the wall panels by means of a tongue of the roof panel, projecting downwardly from the underside of the roof panel and engaged in an upper channel in the wall panel, or alternatively the roof panels may be secured to the upper edges of the wall panels by a beading element secured respectively to the wall panels and the roof panels by orthogonally extending fixing elements.

Such fixing elements may be of any convenient releasable type, such as screw fixings, bolts with threaded nuts, cam operated interengagement elements, and likewise adjacent panels (whether they be walls panels, roof panels or floor panels, may be secured together in their interengaged position by releasable fasteners such as bolts, wedge-shape fasteners, or hook or cam interengagement members.

In the preferred embodiment of the invention the frame members separating the cladding layers of the roof panels are tapered such that the upper cladding layer of a roof panel is inclined to form a pitch roof whilst the lower

cladding member is substantially horizontal. A double-pitch may be achieved by utilising spacing frame members of isosceles triangular shape. In other embodiments the roof panels may be substantially flat to define a so-called "flat" roof.

At least one of the wall panels is formed with a prepared opening defined by a frame to form at least part of a window or door. Such openings may be formed at the junction between two adjacent panels, in which case each panel is formed with a notch in one edge which incorporation with the corresponding notch in the opposite edge (facing it) of the other panel defines the opening.

The present invention also comprehends a panel for a dismantleable prefabricated modular building comprising two cladding layers of rigid material spaced by an internal framework of spacing frame members, at least one edge of the panel being provided with a longitudinal channel defined by edge portions of the cladding layers projecting beyond an elongate spacing frame member extending generally parallel to the said edges, and at least one other edge of the panel having a tongue projecting laterally of the panel and extending generally parallel to the said other edge.

Preferably the said tongue extends substantially wholly

along the said upper edge.

One embodiment of the present invention comprises a panel adapted as a floor panel and having one cladding layer of greater thickness than the other cladding layer whereby to form a floor surface.

The said spacer frame members may extend parallel to one pair of parallel edges of the panel or there may be spacer frame members extending in more than one direction. For example, if the panels are rectangular the spacing frame members may be orthogonal to one another and generally parallel to the edges of the panel.

A panel adapted as a floor panel may have a prefabricated connector tongue attached to the cladding layer which will be the upper layer in use (which, as mentioned above, may be thicker than the other cladding layer) extending parallel to the said edge, projecting orthogonally of the plane of the panel and spaced from the said edge by at least the thickness of the cladding layers forming the wall panels.

The panel cladding layers of both wall, floor and roof panels may be formed of the same material for both layers, and if not at least one layer (although preferably both layers) may be formed from a fire resistant material.

In a preferred embodiment of the invention the cladding layers are formed from a fire resistant cement-based material sold under the trade name PYROC. Such a panel may be made further fire-resistant by the incorporation of a fire-resistant filler between the cladding layers. Such a filler may fill the spaces between frame members or, if of a material having appropriate mechanical properties, may constitute, or replace, the spacer frame members. Such fire resistant panels may be incorporated in the wall, floor or roof structure or as internal partitioning, possibly with additional fire-proofing materials incorporated in or covering joints between interconnected parts.

Releasable clamp fastenings in the form of two-part interengageable members may be provided for securing adjacent panels together. Such two-part interengageable fastenings may comprise a first member carried on a tongue and a second member carried within a cooperating channel in positions such that the two cooperating members can interengage when the panels are fitted together.

Alternatively the interengagement may be achieved by a single removable member which can be introduced between aligned openings in the projecting flanges defining the channel and the cooperating tongue. Such member may have a non-circular or cam-shape profile and the aligned

openings may be offset from one another such that in a first angular orientation the removable member can be introduced freely through the common opening defined by the offset apertures, and in a second orientation, preferably inclined at 90° to the first, shoulders of the member engage faces of the flanges to prevent withdrawal. The cam-shape profile may also provide a degree of tightening drawing the tongue more deeply into the channel as the member is turned through 90^0.

Embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a general arrangement view in perspective of a modular building formed according to the principles of the present invention;

Figure 2 is a face view of a wall panel formed as an embodiment of the present invention;

Figure 3 is a perspective view of the wall panel illustrated in Figure 2;

Figure 4 is a perspective view of an alternative wall panel formed as another embodiment of the invention;

Figure 5 is a horizontal section of the wall panel of Figure 4 shown in position defining a corner with a wall panel as shown in Figure 3;

Figure 6 is a separated view showing the assembly of a corner utilising the wall panel of Figure 4;

Figure 7 is a perspective view of a floor panel;

Figure 8 is a perspective view of a roof panel;

Figure 9 is a cut away view illustrating the internal structure of the roof panel of Figure 8;

Figure 10 is a floor plan illustrating the structure of a building utilising floor and wall panels of the invention;

Figure 11 is a floor plan showing the arrangement of a larger building utilising modular panels of the same size as in the building of Figure 10;

Figure 12 is a perspective view on an enlarged scale illustrating the interengagement of a tongue and channel of two adjacent wall panels and a fixing pin by which the interengagement can be secured;

Figure 13 is schematic part-cut-away perspective view of a corner panel according to a further embodiment of the invention,

Figure 14 is a plan view of the corner panel of Figure 13; and

Figure 15 is a cross-sectional view of a partition usable in a building similar to Figure 1.

Referring now to Figure 1 there is shown a dismantleable modular building comprising a roof generally indicated 11 composed of a plurality of modular roof panels 12, walls 13, 14 each composed of a plurality of modular wall panels 15 and a floor 16 composed of a plurality of modular floor panels 17.

Two adjacent wall panels 15_1 and 15_2 have respective recesses 18, 19 in facing edges to define a rectangular window opening 20 when the two panels are interengaged as illustrated in Figure 1. A door opening 21 is formed in a wall panel 15_3.

A typical wall panel 15 is illustrated in Figure 2 and Figure 3. The wall panel 15 is composed of two parallel flat cladding layers 22, 23 separated by a framework of spacer frame members comprising four parallel frame members 24, 25, 26 and 27 and two transverse frame members 28, 29 extending orthogonally thereto. The frame members 24, 27 and 28, 29 define a rectangular frame boundary with the frame members 25, 26 constituting reinforcing internal frame members.

The frame member 24 is of greater width than the other frame members and projects from one edge 30 of the panel 15, whilst the parallel opposite frame member 27 is spaced by a corresponding distance inwardly from the opposite edge 31 of the panel 15 to form a channel 34. Likewise, the transverse frame members 28, 29 are spaced corresponding distances from respective upper and lower edges 32, 33 of the panel 15 to define respective upper and lower channels 35, 36 in the panel 15.

Longitudinal adjacent panels 15 are fitted together by interengagement of the tongue 24 with the cooperating

channel 34. Retaining means for securing the tongue in the channel will be described hereinbelow with particular reference to Figure 12.

Figures 4, 5 and 6 illustrate an alternative panel structure in which corresponding components are identified with the same reference numerals as in Figures 2 and 3, with the addition of a subscript letter a. Thus, panel 15a is composed of two cladding layers 22a, 23a spaced by a framework of which only the channel-defining frame member 27a along the left hand lateral edge and the channel-defining upper frame member 28a are visible in Figure 4. The panel 15a of Figure 4 differs from that of Figures 2 and 3 by the provision of a transverse tongue 24a in place of the parallel tongue 24. As can be seen in Figure 5, this tongue engages in the channel 34 of an adjacent panel 15 to define a corner of the building and, as can be seen in Figure 6, the inclination which the panel 15a must adopt in order to position it as the last panel in a rectangular wall structure of a building is defined by the depth of the tongue 24a to be a matter of only a few degrees. It will be seen that if the panel 15 is 48" (120cm) wide and the tongue 24a is 2" (5cm) the angle α by which the panel 15a must be inclined from its final position in order to position the panel itself is given by:

$$\tan \alpha = 2/48 = 0.04166$$

$$\alpha = 2.38°$$

This is clearly within the tolerances of the structure.

Figure 7 illustrates a floor panel of similar structure to that of Figure 4, but differing in that an upper cladding layer 40 is approximately twice the thickness of a lower cladding layer 41, and that the panel (generally indicated 39) is of rectangular form (typically 8ft by 4ft (2.4 metres by 1.2 metres)) and the opposite longer edges are provided, respectively, with a tongue 42 and a channel (not shown) whilst the opposite shorter edges have frame members 43, 44 flush with the edges of the cladding layers 40, 41. Finally, the upper cladding layer 40 has two upwardly projecting tongues 45, 46 extending parallel to the shorter edges and spaced inwardly from these edges by a distance approximately equal to the thickness of the cladding layers 22, 23 of the wall panels.

A building of 8ft by 16ft (2.4 metres by 4.8 metres) can then be formed by placing four such floor panels with their longitudinal edges interengaged, and building a wall around the perimeter.

A roof panel structure is illustrated in Figures 8 and 9.

The roof panel generally indicated 50 is composed of a substantially flat lower panel 51 spaced from a two-part upper panel 52, 53 by a plurality of spacer frame members

54, 55, 56, 57 extending parallel to the longer edges of the rectangular panel 51, and two transverse frame members 58, 59 extending parallel to the shorter edges of the panel.

The spacer frame member 54 is of greater thickness than the frame members 55, 56, 57 such that it projects from the edge of the panel to form a tongue, whilst the spacer frame member 57 is positioned inwardly from the adjacent longer edge of the panel to form a channel 60. Tongues 61, 62 extending parallel to the shorter edges of the roof panel 50 and projecting downwardly from the lower panel 51 thereof are provided to interengage in the upper channels 35 of the wall panels 15.

Reinforcing ridge frame members 63, 64, 65 span adjacent peaks of the isosceles frame members 54-57. Figure 10 shows the floor plan for a building utilising four floor panels 40 separately identified as panels 40_1, 40_2, 40_3 and 40_4. The two central panels 40_2 and 40_3 are exactly identical to the panel illustrated in Figure 6, having opposite tongues 45, 46 parallel to the shorter edges thereof, whilst the panels 40_1 and 40_4 are provided with tongues 66, 67 extending along three sides to form a wide shallow U-shape.

It will be appreciated that, by utilising corner panels such as that illustrated in Figure 4 the junctions

between adjacent modular panels of the building are offset from the junctions of the floor panels 40 as illustrated by the broken lines 66 in Figure 10.

Figure 11 illustrates the floor plan for a building having twice the width utilising 8 rather than 4 modular floor panels 40. Here it will be seen that those panels identified as type B are similar to the floor panel illustrated in Figure 7, but with the tongue 46 omitted, whilst floor panels identified as type C1 and type C2 have tongues along two contiguous edges, one pair being handed in one direction and the other pair in the other direction to form diagonally opposite corners. Again, junction lines 66 illustrate the position of the junctions between adjacent wall panels, which, again, can be seen to offset from the junction lines between adjacent floor panels. Likewise, it will be appreciated that the junction lines between adjacent wall panels on opposite parallel walls of the building are offset from one another and this increases the strength of the building by avoiding coincident junction lines.

Finally, Figure 12 illustrates a tongue and channel coupling in which it will be seen that the tongue has a circular transverse opening 70 whilst the channel flanges have two aligned non-circular openings which have been shown as oval although eliptical or other non-circular shapes may be used.

A connector pin generally indicated 73 has three sections comprising a central section 74 equal in length to the thickness of the tongue 24 and two outer or end sections 75, 76 equal in length to the thickness of the cladding layers 22, 23. The two end sections 75, 76 are circular in cross section of a diameter equal to the narrow diameter of the whole 71, 72 in the flanges defining the channel and the central section 74 has a cam-shape the lobe of which has a maximum dimension just less than the diameter of the hole 70 in the tongue 24. One or both of the end sections 75, 76 has a slot 77 (shown in the section 75 in Figure 12) serving for engagement of an operating tool and as an indicator, the slot being parallel to the major dimension of the cam 74. When the tongue 24 has been introduced into the channel of the adjacent panel, the openings 70, 71, 72 are aligned with one another and the pins 73 can be introduced with the cam 75 and slot 77 in a vertical (up or down) orientation. By then rotating the pin 73, utilising the tool engaged in the slot 77, through 90^0 the surface of the opening 70 is engaged by the cam lobe to urge this more tightly into the channel, and at the same time the shoulders 78, 79 separating the central sections 74 from the end sections 75, 76 of the pin 73 engage against the interior faces of the flanges defined by the projecting parts of the cladding layers 22, 23 to prevent withdraw of the pin. This simple interconnection forms a tight coupling which, however, is readily releasable when it is

desired to dismantle the building.

With reference to Figures 13 and 14 an alternative panel is shown for forming a corner of a building instead of the panel of Figure 4 and is generally indicated 115. Features similar to those of the panel 15 of Figures 2 and 3 are indicated by the same numerals increased by 100.

The corner panel member 115 is composed of a framework of spacer frame members including four parallel upright members 124, 125, 126 and 127 and transverse members 128a, 129a and 128b, 129b. The frame members 124, 125, 128a, 129a makes up a first rectangular frame, generally indicated 130 while the frame members 126, 127, 128b and 129b make up a second rectangular frame 131, the two frames 130, 131 being arranged at right angles to each other and abutting along juxtaposed vertical faces of the frame members 125, 126, 128a, 128b and 129a, 129b respectively.

The corner member 115 is completed by cladding panels 122a, 123a applied to opposite faces of the frame 130 and 122b, 123b applied to opposite faces of the frame 131, the panel 122b being extended to cover the exposed end face of the frame 130, constituted by a face of its frame member 125.

The frame member 127 is inset from the edges of the cladding panels 122b, 123b to form a vertical channel 134 while the frame member 124 projects beyond the edges of its cladding panels 122a, 123a to form a tongue. An upper channel 135 and lower channel (not visible) are also formed corresponding to the channels 35, 36 of Figure 3.

It will be understood that the corner member 115 can be incorporated in a building construction similar to that of Figure 1 in conjunction with wall panels 15, floor panels 17 and roof panels 12 with the channel 134 receiving the tongue 24 of the end wall panel of one wall and the tongue 124 fitting into the channel 34 of the end wall panel of an adjacent wall at right angles to the first.

With reference to Figure 15, this shows the internal construction of a panel suitable for use as a partition in a building such as the building of Figure 1. The panel generally indicated 200 has a rectangular wooden internal framework of which the upper and lower members are shown indicated at 201, 202 with external cladding panels 203. The interior of the panel 200 may be filled with an insulating material 204.

The panel 200, seats by means of a lower channel 205 on tongue 206 upstanding from the floor 207, skirting boards

208 being applied on either side of the panel 200. The upper frame member 201 of the panel projects beyond the cladding panels 203 and is spaced from a tongue member 210 similar to the floor tongue 206 but fixed to the ceiling 211. The two tongues 201, 210 are connected by longitudinally extending plates 212, one on either side of the tongues 201, 210 leaving a space 213 between them. The plates 212 are then covered by coving strips 214.

The partition system as a whole may be rendered fire retardant in accordance with British Standard BS 476 part 22 - 1987 by inclusion of an intumescent seal around the perimeter of the frame elements, for example, with reference to Figure 2, the element 24 which defines the tongue and the elements 27, 28, 29 which define the bottom of the grooves. Typically the intumescent seal is housed in a perimetral groove and the panel is formed with a construction in accordance with the following:

Floor tongue 206	-	70mm x 45mm softwood
Lower frame member 202	-	70mm x 32mm softwood
Upper frame member 201	-	70mm x 45mm softwood
Cladding panel 203	-	6mm PYROK (RTM)
Insulation 204	-	75mm ROCKWOOL slab RWA45
Skirting and coving	-	12mm x 150mm PYROK (RTM)

In the embodiment of Figure 15 the seal 215 is shown in place in the cross members 201, 202. This seal naturally

goes right round the panel in two uprights which are not visible in Figure 15.

CLAIMS

1. A system for constructing a dismantleable prefabricated modular building comprising a plurality of interlocking panels each composed of two cladding layers of rigid material spaced by an internal framework of spacing frame members, in which at least one edge portion of each panel has a longitudinal channel defined by edge portions of the cladding layers projecting beyond an elongate spacing frame member extending generally parallel to the said edge portion, and an opposite edge portion of each panel has a tongue extending parallel to said edge portion but projecting therefrom for cooperating engagement in a said longitudinal channel of another of said panels to interconnect the panels, the said tongues of at least some of the panels projecting orthogonally of the edge portions defining the longitudinal channels to enable the respective panels to be used as corner members of the building.

2. A system as claimed in Claim 1, in which the said at least some panels are generally planar and the said tongues project from the plane of the panel.

3. A system as claimed in Claim 1, in which the said at least some panels are composed of two panel parts connected at right angles to each other at a connecting edge, the free edge portion of one panel part extending

parallel to the connecting edge being formed with the longitudinal channel and the free edge portion of the other panel part, constituting the said opposite edge portion, being provided with the said tongue projecting therefrom in the plane of that panel part.

4. A system as claimed in any one of the preceding claims, in which there are further provided interconnecting member spanning the junctions at upper edges of a wall composed of a plurality of panels.

5. A system as claimed in any preceding claim, including a composite roof composed of a plurality of panels each having two cladding layers and opposite edges formed with cooperating tongues and channels for interengagement between adjacent roof panels.

6. A system as claimed in any preceding claim, in which there is further included a composite floor composed of a plurality of panels each formed from two cladding layers spaced by an internal framework of spacer frame members and opposite edges of which ar0e formed with respective channels and tongues for interengagement between adjacent such floor panels.

7. A system as claimed in Claim 6, in which interengagement between the composite floor and the wall panels is achieved by an elongate tongue of the floor

panels engaged by a channel in the bottom edge of each wall panel.

8. A system as claimed in any of Claims 5 to 7, in which the roof is secured to the upper edges of the wall panels by means of a tongue fixed to the underside of the roof panels and engaged in an upper channel in the wall panels.

9. A system as claimed in any of Claims 5 to 7, in which the roof panels are secured to the upper edges of the wall panels by a beading element secured respectively to the wall panels and the roof panels by orthogonally extending fixing elements.

10. A system as claimed in any preceding claim, in which adjacent panels interengaged by respective tongues and grooves are held together by releasable fasteners having hook or cam interengagement members.

11. A system as claimed in any of Claims 5 to 10, in which the frame members separating the cladding layers of the roof panels are tapered such that the upper cladding layer of a roof panel is inclined to form a roof pitch whilst the lower cladding member is substantially horizontal.

12. A system as claimed in any preceding claim, in which

at least one of the wall panels is formed with a prepared opening defined by a frame to form at least a part of a window or door.

13. A panel for a dismantleable prefabricated modular building comprising two cladding layers of rigid material spaced by an internal framework of spacing frame members, at least one edge of the panel being provided with a longitudinal channel defined by edge portions of the cladding layers projecting beyond an elongate spacing frame member extending generally parallel to the said edges, and at least one other edge of the panel having a tongue projecting laterally of the panel and extending generally parallel to the said other edge.

14. A panel as claimed in Claim 12, in which the said tongue extends substantially wholly along the said other edge.

15. A panel as claimed in Claim 11 or Claim 12, adapted as a floor panel and having one cladding layer of greater thickness than the other cladding layer whereby to form a floor.

16. A panel as claimed in any of Claims 13 to 15, in which the said spacer frame members extend substantially parallel to one pair of parallel edges of the panel.

17. A panel as claimed in any of Claims 13 to 16, adapted as a floor panel, and having a prefabricated connector tongue attached to the cladding layer which will be the upper layer in use (the thicker cladding layer) extending parallel to the said edge, projecting orthogonally of the plane of the panel and spaced from the said edge by at least the thickness of the cladding layers forming the wall panels.

18. A system as claimed in any of Claims 1 to 12, in which the panel cladding layers are formed of a fire resistant cement-based material.

19. A system as claimed in any of Claims 1 to 12 and Claim 18, in which the said internal framework is provided with an intumescent strip extending at least part way around each panel.

20. A panel as claimed in any of Claims 13 to 17, in which the said framework of spacing frame members has an intumescent strip extending at least part way around the panel.

21. A panel as claimed in Claim 19, in which the said intumescent strip is housed in a groove in the frame members and extends entirely around the panel.

22. A panel as claimed in any of Claims 13 to 17 or 19,

further comprising releasable clamp fastenings in the form of two-part interengageable members one of which is carried on a tongue and the other of which is carried within a cooperating channel in positions such that two cooperating members can interengage when two panels are fitted together.

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Examiner's report to the Comptroller under Section 17
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Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1-22

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

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&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
A	GB 1181857	P and A	
A	WO 87/04744 A1	(MEIRY)	

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).